

# NEW RECORDS OF ENTOCYTHERID OSTRACODS INFESTING BURROWING AND CAVE-DWELLING CRAYFISHES, WITH DESCRIPTIONS OF TWO NEW SPECIES

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*Abstract.*—The ranges, including several scores of new localities, of 15 entocytherid ostracods infesting burrowing and cave-dwelling crayfishes collected in the southeastern United States (most from Kentucky, Tennessee, and West Virginia) are summarized. The genera represented are *Ascetocythere*, *Cymocythere*, *Dactylocythere*, *Donnaldsoncythere*, *Lordocythere*, *Phymocythere*, and *Uncinocythere*. The new *Dactylocythere cryptoterensis* and *Phymocythere lophota* are described from Upshur and Wirt counties, West Virginia, respectively.

This study of entocytherids associated with burrowing and cave-dwelling crayfishes was prompted by the receipt of some 50 lots of ostracods from Raymond F. Jezerinac and G. Whitney Stocker, of The Ohio State University at Newark. The specimens were retrieved by them from crayfish collections made from burrows and caves in Kentucky and West Virginia. Augmenting these lots are a large number of samples provided us previously by Raymond W. Bouchard, of the Academy of Natural Sciences of Philadelphia. This report consists of summaries of the distributions of the 15 entocytherid species that were obtained in the collections made by Jezerinac and Stocker; included also are new locality records provided by Bouchard and others. Two of the species included are previously undescribed, *Dactylocythere cryptoterensis* and *Phymocythere lophota*, both from West Virginia.

As has been pointed out in many previous entocytherid studies, most collections have been made by students of crayfishes and usually all of the specimens collected in a locality were preserved together in a single container. Consequently only in instances in which a single crayfish species was collected at a locality can one be certain as to

the host of the ostracods found in the container. Thus all of the crayfishes listed under "Hosts" below should be considered "possible hosts." Definitely established associations with hosts are marked by asterisks (\*).

The synonymies presented include citations to the original description, and update the synonymies and references cited by Hart & Hart (1974) or Hobbs & Peters (1977). Among the abbreviations used in listing the localities are: Ck = creek, R = river, US Hwy = U.S. Highways, Rte = State Highways or Routes, Co. Rd = County Roads, cos = counties. In citing the hosts, subgeneric names are omitted as are citations to their authors and dates, all of which are listed in a recent checklist of American crayfishes (Hobbs 1989).

*Ascetocythere myxoides* Hobbs & Hart

*Ascetocythere myxoides* Hobbs & Hart, 1966:45-46, figs. 21-23.—Hart & Hart, 1974:42-43, pl. VIII, figs. 1-3, pl. XLVII.

*Previously known range.*—Reported from the Cheat and Potomac basins from only 2 localities in Randolph County, West Virginia (type locality), and Prince Georges

County, Maryland. Subsequent collecting in the latter locality failed to disclose the presence of either the entocytherid or its host, and inasmuch as neither has been reported to occur in the piedmont or coastal plain section of Maryland and neighboring states, the latter locality must be questioned.

*New locality records.* — West Virginia: Grant Co., 4.1 airmi (6.6 airkm) SW of Streby on Nat. Forest Rd, 18 Aug 1985, R. F. Jezerinac, on *Cambarus b. bartonii* & *C. monongalensis*. Preston Co., Ditch 1.0 mi (1.6 km) N of Brandonville, 10 Sep 1984, G. W. Stocker, on *C. dubius*. Pocahontas Co., Roadside ditch and seep 1.0 mi (1.6 km) S of Thornwood on US Hwy 250, 23 Jun 1987, GWS, RFJ, on *C. monongalensis* and *C. bartonii carinirostris*. Randolph Co., E shore of Shavers Fk of Cheat River in Monongahela Nat. Forest, 28 Jul 1969, C. Adler, S. Arnold, on *C. monongalensis*. Pennsylvania: Greene Co., 1.8 airmi (2.9 airkm) NE of Crabapple, 15 Sep 1984, GWS, V. Stocker, on *C. monongalensis*.

Hosts: *Cambarus b. bartonii*, *C. b. carinirostris*, *C. dubius*\*, and *C. monongalensis*\*. This entocytherid is probably restricted to the last two species.

*Drainage systems.* — Cheat and Guyandotte basins (to Ohio and Mississippi) and perhaps the Potomac basin.

*Ascetocythere riopeli* Hobbs & Walton

*Ascetocythere riopeli* Hobbs & Walton, 1976: 393–395, fig. 1a–d.

*Previously known range.* — The Cumberland Basin from only 2 localities in Letcher and Pike counties, Kentucky.

*New locality records.* — Kentucky: Wolfe Co., Roadside ditch 2 mi (3.2 km) S of Rogers on Big Andy Ridge Rd, off Rte 715, 10 Oct 1987, GWS, RFJ, et al., on *C. dubius*. Breathitt Co., Seep 3.0 mi (4.8 km) NNE of Camp Lewis on Rte 30, 16 Apr 1988, GWS, RFJ, et al., on *C. dubius*.

Host: *Cambarus buntingi*, *C. distans*, *C. dubius*\*, *C. robustus*, and *Orconectes rusti-*

*cus*. As pointed out by Hobbs and Walton, 1976:396, “it is highly probable that this ostracod is confined to [the burrowing] *C. dubius*.”

*Drainage systems.* — Big Sandy, Cumberland, Kentucky, and Licking basins (to Ohio and Mississippi).

*Ascetocythere sclera* Hobbs & Hart

*Ascetocythere sclera* Hobbs & Hart, 1966: 42–43, figs. 15, 16. — Hart & Hart, 1974: 40–41, pl. VIII, figs. 8–13, pl. XLVII. — Hobbs & McClure, 1983:777. — Hobbs & Peters, 1991:71–72.

*Previously known range.* — Big Sandy, Clinch, Elk, Guyandotte, Kanawha, and Potomac basins in Buchanan, Dickinson, Highland, Russell, and Tazewell counties, Virginia; and Clay, McDowell, Raleigh (type locality), and Wyoming counties, West Virginia.

*New locality records.* — West Virginia: Boone Co., Seep, 4.3 mi (6.9 km) N of Kopperston on Rte 85, 5 Jul 1988, GWS, RFJ. Kanawha Co., Kanawha State Forest campground, 5 mi (8.5 km) W of Marmet, 8 Oct 1988, GWS, RFJ. Wyoming Co., Burrows along spring in Twin Falls State Park, 7.8 mi (12.5 km) E of Pineville, 6 Jul 1988, GWS, RFJ. Ditch 1 mi (1.6 km) N of McGraws on Co. Rd 5, 29 Jul 1988, GWS, T. Jones. *Cambarus dubius* served as the host in all of these localities.

*Host.* — It is probably restricted to *Cambarus dubius*.

*Drainage systems.* — Big Sandy, Coal, Elk, Guyandotte, Kanawha basins (to the Ohio and Mississippi); Clinch Basin (to the Tennessee, Ohio, and Mississippi); and Potomac Basin.

*Cymocythere gonia* Hobbs & Hart

*Cymocythere gonia* Hobbs & Hart, 1966: 51, figs. 36, 37. — Hart & Hart, 1974:44–45, pl. IX, figs. 12–14, pl. XLVII. — Hobbs & Walton, 1975:15.



*Previously known range.* — Holston Basin from 2 localities in Grainger (type locality) and Loudon counties, Tennessee.

*New locality records.* — Alabama: Cleburne Co., trib to Henry Ck off Co. Rd 66 (T15S, R10E, Sec 26N), 21 Apr 1973, R. W. Bouchard, J. D. Way, on *C. halli* and *C. striatus*. Marshall Co., Trib to Big Spring Ck at Co. Rd 12 (T9S, R2E, Sec 28SW), 20 Apr 1973, RWB, JDW, on *C. striatus*, *Procambarus a. acutus*, and *O. erichsonianus*. Shelby Co., Peavine Ck in Oak Mt. St. Park (T20S, R2W, Sec 8), 24 Mar 1974, RWB, J. W. Bouchard, on *C. striatus*, *C. acanthura*, and *P. lophotus*. Georgia: Catoosa Co., Hurricane Ck above jct with Peters Ck off Rte 151, 24 Apr 1968, E. T. Hall, Jr., H. H. Hobbs, Jr., on *C. extraneus*, *C. girardianus*, *C. striatus*, and *P. lophotus*. Tennessee: Anderson Co., Seepage area on SE side of Poplar Ck at Rte 61, 13–16 Mar 1972, D. A. Etnier, F. L. Oakberg, on *C. deweesae*. Blount Co., Pitner Ck off Co. Rd 2427, NW of Ellejoy, 4 May 1970, D. Walker, on *C. bartonii cavatus*, *C. longirostris*, *O. erichsonianus*. Swamp on US Hwy 129 approx 2.5 mi (4 km) N of Rte 72, 27 Apr 1971, DAE, on *C. acanthura*, *C. striatus*. Temporary pond at Co. Rd 2423, NE of Midway, 30 Apr 1970, RWB, on *C. acanthura*, *C. striatus*, *C. longirostris*. Cocke Co., Burrows between Del Rio and Harmony Grove on St Rte 107, 2 March 1972, RWB, FLO, DAE, C. Saylor, J. P. Dewees, on *C. acanthura*. Grainger Co., ditch, 1 mi (1.6 km) N of Bean Station on unnumbered Co. Rd, 23 Jul 1987, GWS, RFJ, D. Chrisman, on *Cambarus acanthura* and *C. striatus*. Sevier Co., Ditch, 3 mi (4.8 km) E of Boyds Creek on Rte 338, 31 Mar 1986, GWS, RFJ, on *C. diogenes*. Cove Ck at Co. Rd 2422, SW of Pigeon Forge, 22 Apr 1969, RWB, on *C. b. bartonii*, *C. longirostris*, *O. erichsonianus* and *O. forceps*.

*Hosts.* — *Cambarus acanthura*\*, *C. bartonii bartonii*, *C. b. cavatus*, *C. halli*, *C. diogenes*\*, *C. longirostris*, *C. striatus*, *C. deweesae*\*, *Orconectes erichsonianus*, *O.*

*forceps*, *O. spinosus*, *Procambarus a. acutus*, and *P. lophotus*.

*Drainage systems.* — Holston, French Broad, and Tennessee basins (to Ohio and Mississippi) and Cahaba and Tallapoosa basins (to Alabama and Mobile rivers).

*Dactylocythere coloholca* Hobbs & Hobbs

*Dactylocythere coloholca* Hobbs & Hobbs, 1970:7, fig. 2.—Hart & Hart, 1974:53–54, pl. III, figs. 1–5, pl. XLVIII.

*Previously known range.* — A single locality in the Cumberland Basin in Whitley County, Kentucky; no subsequent report of it has appeared in the literature.

*New locality records.* — Kentucky: Breathitt Co., Ditch 1.0 mi (1.6 km) S of Co. line on Rte 30, 16 Apr 1988, GWS, RFJ, M. Allen, on *C. dubius*. Morgan Co., Ditch 2.5 mi ENE of Hazel Green on unnamed Rd off Rte 203, 10 Oct 1987, GWS, RFJ, D. Chrisman, P. Matesich, on *C. dubius*. Wolfe Co., Ditch in Koomer Ridge National Forest campground, campsite No 4, 4.2 mi (6.7 km) ESE of Slade, 10 Oct 1987, GWS, RFJ, et al., on *C. dubius*. Ditch along Big Andy Ridge Rd off Rte 715, 2.0 mi (3.2 km) S of Rogers, 10 Oct 1987, GWS, RFJ, DC, PM, on *C. dubius*. Tennessee: Morgan Co., 11.6 mi (18.6 km) E of Grimsley on Co. Rd., 5 Jul 1969, P. C. Holt, V. F. Holt, on *C. crinipes* and *C. sphenoides*. Fentress Co., Frizsche Ck, about 0.1 mi (0.2 km) E of Allardt on unmarked road, 10 Jul 1969, PCH, VFH, on *C. distans*. Campbell Branch, 0.4 mi (0.7 km) NW of jct Rte 52 on unmarked road, 10 Jul 1969, PCH, VFH, *C. distans*. Virginia: Lee Co., Wallin Ck. 0.5 mi (0.8 km) W of Scott Co. line on US Hwy 58, 15 Nov 1970, RWB, JDW, on *C. longirostris*, *C. (C.)* sp., *Orconectes erichsonianus*. West Virginia: Upshur Co., Burrows at jct of Rte 20 and Co. Rd 40/2, 0.2 mi (3.2 km) N of Arlington, 26 May 1989, GWS, RFJ, on *C. diogenes*.

*Hosts.* — *Cambarus crinipes*, *C. di-*

*ogenes*\*, *C. dubius*\*, *C. distans*\*, *C. longirostris*, *C. sphenoides*\*, *C. sp.*, and *Orconectes erichsonianus*.

*Drainage systems.*—Cumberland, Kentucky, Little Kanawha, Powell, and Tennessee basins (to Ohio and Mississippi).

*Remarks.*—Specimens collected in the localities cited above in Morgan and Wolfe counties, Kentucky, are somewhat smaller than those reported from the type locality by Hobbs & Hobbs (1970): ranging from 420 to 460 ( $\bar{X}$  = 437)  $\mu\text{m}$  in length and 231–259 ( $\bar{X}$  = 241)  $\mu\text{m}$  in height. In addition, the subangular posteroventral margin of the shell is sometimes more rounded; of the 3 teeth on the preaxial border of the clasping apparatus, only the most proximal is well developed; and the accessory groove in some of the specimens almost reaches the level of the dorsal extremity of the spermatic loop.

*Dactylocythere crawfordi* Hart

*Dactylocythere crawfordi* Hart, 1965:255, figs. 1, 2.—Hart & Hart, 1974:55, pl. XIII, figs. 10–13, pl. XLIV.—Hobbs & McClure, 1983:776.—Hobbs & Peters, 1989:327; 1991:67, 71.

*Previously known range.*—Great Miami, Little Miami, Muskingum, Ohio, Scioto, and White basins in Decatur, Marion, and White counties, Indiana; Auglaise, Clinton, Franklin, Jackson, Licking, and Logan (type locality) counties, Ohio; and Mason County, West Virginia.

*New locality records.*—(The host was *Cambarus diogenes* unless otherwise noted.) Kentucky: Christian Co., Creek in Perryville State Park off Rte 109, Apr 1969, J. E. Pugh, D. J. Peters, HHH. Taylor Co., Ditch 1.0 mi (1.6 km) SW of Mannsville on Rte 70, 25 Mar 1987, GWS, RFJ, on *Cambarus diogenes* and *C. ortmanni*. Ohio: Erie Co., Ditch, 3.2 mi (5.7 km) SE of Castalia, 9 Oct 1983, J. Norrocky; Miller Rd,  $\frac{3}{5}$  mi (1 km) E of Rte 99, 29 Oct 1983, JN; Ditch on Wahl Rd just E of White's Landing, 15 Mar 1984, JN. Jackson Co., 2.8 mi (4.5 km)

NNE of Jackson, 1 May 1983, GWS, RFJ, R. F. Thoma. Ottawa Co., 8.1 mi (12 km) NE of Clinton, 10 Oct 1983, JN, on *Orconectes rusticus*. Perry Co., ditch 2.75 mi (4.4 km) WSW of Corning, 3 Sep 1983, JN. Pond bank 8 mi (12.8 km) SE of New Lexington, 3 Sep 1983, JN. Sandusky Co., W side of White's Landing, Sec 4, between Rts 277 & 283, 11 Dec 1983, JN, on *F. fodiens*. 1 mi (1.6 km) S of White's Landing, 22 Nov 1983, JN. Ditch 2 mi (3.2 km) NNW of Vickery, 20 Feb 1984, JN, on *F. fodiens*.

*Hosts.*—*Cambarus diogenes*\*, *C. laevis*, *C. ortmanni*, *F. fodiens*\*, *Orconectes s. sanbornii*, and *O. rusticus*\*.

*Drainage systems.*—White Basin (to Wabash and Mississippi); Little Basin (to Cumberland, Tennessee, Ohio, and Mississippi); Great Miami, Little Miami, Scioto, Raccoon, Licking-Muskingum, Hocking, Kanawha, and Green basins (to Ohio and Mississippi); and Lake Erie Basin.

*Dactylocythere crena* Hobbs & Walton

*Dactylocythere crena* Hobbs & Walton, 1975:14, figs. 2a–f.

*Previously known range.*—Known from only the type locality in the French Broad Basin, in Loudon County, Tennessee.

*New locality records.*—Through an oversight, Hobbs and Walton did not cite the two following localities from which they had specimens: Tennessee: Blount Co., Banks of little Tennessee River between Harrison Branch and Tallasee at Rte 72 and US Hwy 129, 26 Apr 1970, DAE, on *C. striatus*. Temporary pond at Co. Rd 2423, NE of Midway, 30 Apr 1970, RWB, on *C. acanthura*, *C. striatus*, *C. longirostris*. An additional record was recently obtained in Sevier Co., 3 mi E of Boyds Creek on Rte 338, 31 Mar 1986, GWS, RFJ, on *C. diogenes*.

*Hosts.*—*Cambarus acanthura*, *C. diogenes*\*, *C. longirostris*, and *C. striatus*\*.

*Drainage systems.*—French Broad and Little Tennessee basins (to Tennessee, Ohio, and Mississippi).



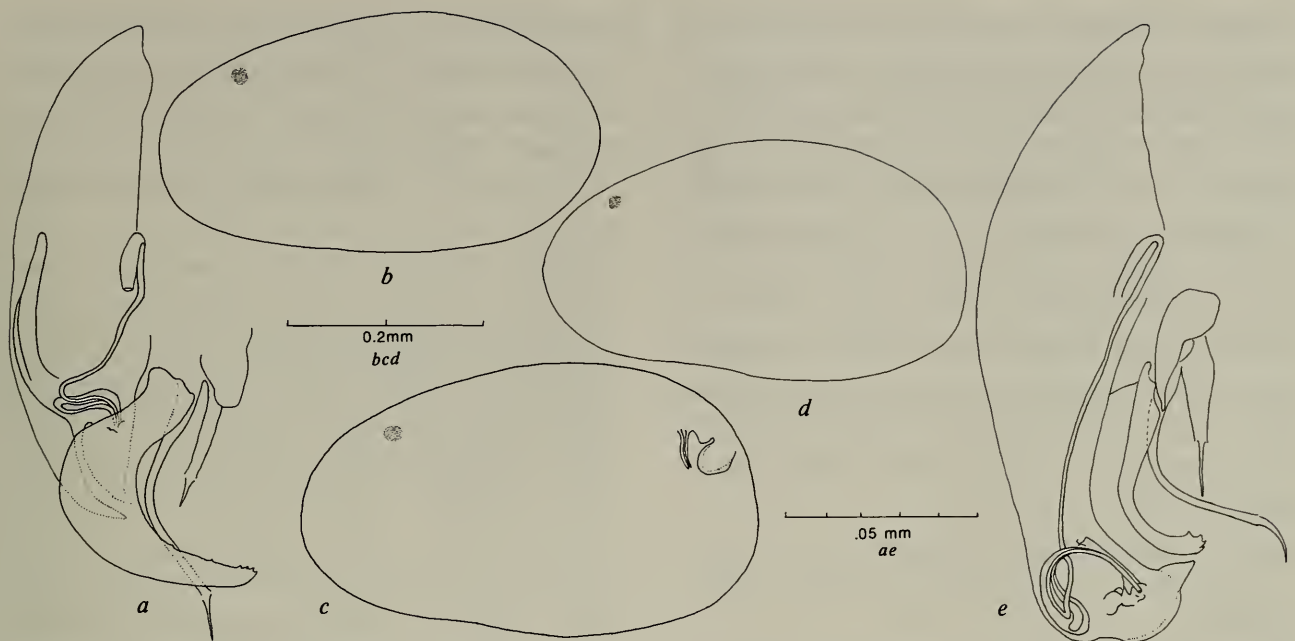


Fig. 1. a-c, *Dactylocythere cryptoteris*, n. sp.; d, e, *Phymocythere lophota*, n. sp. (a, e, Copulatory complex of paratype male; b, d, Shell of holotype male; c, Shell of allotypic female).

*Dactylocythere cryptoteris*, new species  
Fig. 1a-c

**Diagnosis.** — Male with eye pigmented and located about 0.2 shell length from anterior margin. Shell (Fig. 1b) ovate with greatest height slightly posterior to midlength where 1.3 times height at levels of eye. Margin entire, lacking emarginations and prominences and nowhere angular. Submarginal setae absent dorsally and more abundant anterodorsally and posteroventrally. Shell length of males 413-448 ( $\bar{X} = 425$ ,  $n = 4$ )  $\mu\text{m}$ ; shell height 224-238 ( $\bar{X} = 229$ ,  $n = 4$ )  $\mu\text{m}$ .

Copulatory complex (Fig. 1a) with arched peniferum gently rounded ventrally and meeting cephalic margin in acute angle. Accessory groove reaching or almost reaching dorsal extremity of spermatic loop. Clasp apparatus with horizontal and vertical rami disposed at angle of about 70 degrees, subequal in length but thickening and merging imperceptibly in area of junction. Dorsal ramus entire, lacking shoulder on cephalic margin, comparatively thick, and weakly sinuous. Horizontal ramus with gently curved, entire postaxial margin; preaxial margin irregular and bearing 2 reduced

(sometimes almost indiscernible) teeth; apex of ramus with 4 acute, reflexed subapical denticles. Finger guard rather obscure but massive, short, and apparently unsclerotized. Dorsal and ventral fingers unremarkable.

**Triunguis female.** — Triunguis female with pigmented eye located 0.2 shell length from anterior margin. Shell (Fig. 1c) ovate with slight concavity ventrally just anterior to midlength; greatest height short distance posterior to midlength where almost 1.4 times height at level of eye. Margins entire and nowhere angular. Submarginal setae as in male. Shell length 420-441 ( $\bar{X} = 431$ ,  $n = 7$ )  $\mu\text{m}$ ; shell height 259-280 ( $\bar{X} = 270$ ,  $n = 7$ )  $\mu\text{m}$ . (Unfortunately several of the females became fragmented in remounting the specimens.)

Genital complex consisting of bulbous tuberculiform lobe situated posterodorsally and projecting cephaloventrally; lacking J-shaped rod and amiculum. Slender tubuliform pendant, which frequently previously identified (perhaps mistakenly) as part of female genitalia, lying immediately anterior to lobe.

**Type locality.** — Crayfish burrows in ditch

at junction of Rte 20 and Co. Rd 40/2, 0.2 mi (3.2 km) north of Arlington, Upshur Co., West Virginia. This locality, sampled on 26 May 1989 by G. W. Stocker and R. F. Jezerinac, is in the Little Kanawha River basin.

*Disposition of types.*—The holotypic male and allotypic female are deposited in the National Museum of Natural History (Smithsonian Institution), USNM 260072 and 260073, respectively. Paratypic males are in the collection of H. H. Hobbs III, Wittenberg University, and the Smithsonian Institution.

*Host.*—*Cambarus diogenes*.

*Entocytherid associates.*—*Dactylocythere coloholca*.

*Relationships.*—*Dactylocythere cryptoteresis* seems to have its closest affinities with those members of the genus in which the females lack an amiculum and is more similar to *D. coloholca* than to the others. The rounded posteroventral margin of the shell, the thickened junction of the rami of the clasping apparatus of the male, the reduced size of the teeth on the preaxial border of the horizontal ramus, and an accessory groove reaching dorsally to about the level of the dorsal extremity of the spermatid loop will distinguish this ostracod from its relatives.

*Etymology.*—*G. crypto* = hidden + *teresis* = guard; alluding to the difficulty in discerning the limits of the finger guard in males of this species; noun in apposition.

*Dactylocythere daphnioides* (Hobbs)

*Entocythere daphnioides* Hobbs, 1955:325, figs. 1–9.

*Dactylocythere daphnioides.*—Hart, 1962: 130.—Hobbs, Holt, & Walton, 1967:42.—Hart & Hart, 1974:56, pl. XIV, figs. 1–5, pl. XLVIII.—Hobbs & Peters, 1977:27, 29–30, 41, 50, 52, 57, 72, fig. 10; 1989: 324, 327–329.

*Previously known range.*—In describing this ostracod, Hobbs (1955) reported material that covered most of the currently

known range. Hobbs, Holt, & Walton (1967: 42) cited a few new localities and described its range as extending “from the Watauga drainage system in Avery and Watauga Counties, N.C.; the New River system from Alleghany and Ashe Counties, N.C., to Pocahontas County, W. Va.; and the Pound drainage system in Dickerson County, Va.” In their monograph, Hart & Hart (1974:56) added a number of new localities among which are four (those from Kentucky, Missouri, Clay and Fentress counties, Tennessee) in need of confirmation. The most recent additions to the range was presented by Hobbs & Peters (1977:28, 72) who cited 32 “localities in the Mountain and upper Piedmont provinces [of North Carolina] in the headwaters of the Pee Dee [Yadkin], Catawba, Little Tennessee, French Broad, Nolichucky, Watauga, and New rivers.” Excluding the questioned localities mentioned above, this entocytherid ranges through the upper Pee Dee, and Catawba basins of North Carolina, the Tennessee River basin above Walden Gorge, headwaters of the Big Sandy River in Virginia, and throughout much of the Kanawha Basin.

*New localities.*—Because it has not been reported previously from subterranean waters, we cite the three following localities: West Virginia: Greenbrier Co., General Davis Cave (37°45'20"N, 80°33'15"W), 9 Sep 1989, GWS et al., on *C. nerterius*. McClung Cave (37°52'52"N, 80°23'24"W) 9 Sep 1989, GWS, D. Hemmerly, TJ, on *C. nerterius*. Pocahontas Co., Cave Creek Cave (38°12'12"N, 80°08'40"W), 20 Jul 1989, GWN, RFJ, TJ, on *C. bartonii carinirostris*.

*Hosts.*—*Cambarus acuminatus*, *C. asperimanus*, *C. b. bartonii*\*, *C. b. carinirostris*\*, *C. chasmodactylus*\*, *C. dubius*\*, *C. longirostris*, *C. longulus*, *C. nerterius*\*, *C. reburrus*, *C. robustus*\*, *C. sciotensis*\*, *C. veteranus*, *Orconectes s. sanbornii*\* and *O. s. erismophorous*\*.

*Drainage systems.*—Scattered localities in headwater tributaries of the Catawba and Little Tennessee rivers in North Carolina



and Tennessee northward, in tributaries of the Tennessee, Pee Dee, Big Sandy, and New rivers, northward to the Greenbrier River in Pocahontas County and Little Kanawha Basin in Wirt County, West Virginia.

*Dactylocythere macroholca* Hobbs & Hobbs

*Dactylocythere macroholca* Hobbs & Hobbs, 1970:9, fig. 3.—Hart & Hart, 1974:62, pl. XVI, figs. 6–10, pl. XLIX.—Hobbs & Walton, 1977:606, 609.—Hobbs & Peters, 1989:326, 327–329; 1991:64, 69.

*Previously known range.*—Known from only 9 localities in the Barren, Cumberland, Kentucky, and Licking basins in Allen, Bath, Madison, and Mason counties, Kentucky; and Fentress, Hawkins, and Pickett counties, Tennessee.

*New localities.*—Seventeen new localities have come to our attention in this study. Indiana: Randolph Co., Ditch 1.4 airmi (2.2 airkm) SSE of Lynx on Co. Rd 700s, 1 May 1986, GWS, RFJ, on *Cambarus diogenes*. Kentucky: Cumberland Co., Roadside ditch at intersection of Rts 912 & 704, 24 Mar 1987, GWS, RFJ, DH, on *C. striatus* and *C. (Jugicambarus)* sp. Grayson Co., Bear Ck at Grayson Springs, 7.4 mi (11.8 km) N of Peoria on Rte 226, 11 Apr 1973, J. E. Pugh, G. B. Hobbs, HHH, on *C. tenebrosus*. Warren Co., Stream 4.4 mi (7 km) SE of Butler Co. line on US Hwy 231, 11 Apr 1973, JEP, GWH, HHH, on *C. graysoni*, *C. tenebrosus*, *C. diogenes*, and *O. putnami*. Stream 4.4 mi (7 km) SE of Butler Co. line on US Hwy 231, on *C. diogenes*, *C. striatus*, *C. tenebrosus*, and *O. putnami*. Tennessee: Cannon Co., Brawley's Fk off Co. Rd 4323 S of Curlee, 28 Mar 1971, RWB, JDW, on *C. graysoni*, *C. sp.*, and *O. placidus*. Clay Co., Hurricane Ck at Rte 52 in Oak Grove, 24 Dec 1968, RWB, W. C. Starnes, on *C. graysoni*, *C. tenebrosus*, *O. compressus*, and *O. putnami*. Big Trace Ck in Hermitage Springs at Rte 52, 11 Mar 1968, RWB, WCS, on *C. graysoni*, *C. rusticiformis*, *O. compressus*, and *O. putnami*. Hurricane Ck at Rte 52,

Oak Grove, 20 Mar 1972, RWB, JDW, on *C. graysoni*, *C. tenebrosus*, *O. compressus*, and *O. putnami*. Davidson Co., Sevenmile Ck at Co. Rd 6158 in Oglesby, 27 Mar 1971, RWB, JDW, on *C. graysoni*, *C. tenebrosus*, *O. shoupi*, and *O. sp.* DeKalb Co., Dry Ck at Co. Rd 4360 off US Hwy 70, S of Dwelltown, 9 Nov 1968, RWB, WCS, on *C. friaufi*, *C. graysoni*, *C. tenebrosus*, and *O. placidus*. Hawkins Co., Approx 3 mi (4.8 km) S of Kyle's Ford on Rte 70, 25 Sep 1971, RWB, DAE, FLO, CS, on *C. dubius*. Lawrence Co., Little Shoal Ck in Davey Crockett St Park off US Hwy 64, 27 Oct 1973, RWB, JWB, on *C. girardianus*, *C. graysoni*, *C. (Hiaticambarus)* sp., *O. spinosus*, and *O. forceps*. Macon Co., Stream about 300 m E of Sumner Co. line at Rte 52, 24 Dec 1968, RWB, WCS, on *C. graysoni*, *O. compressus*, and *O. putnami*. Putnam Co., Falling Water River off US Hwy 70N, NW of Rocky Point, 30 Jul 1969, RWB, R. Sayrs, A. Gnilka, on *C. graysoni*, *C. rusticiformis*, *C. tenebrosus*, and *O. placidus*. Smith Co., Trib of Snow Ck in Elmwood off US Hwy 70, 23 Mar 1971, RWB, JDW, on *C. friaufi*, *C. graysoni*, *C. tenebrosus*, and *O. sp.* Sumner Co., Bledsoe Ck at US Hwy 231-31E and Rte 6, N of Boze, 24 Mar 1971, RWB, JDW, on *C. graysoni*, *C. tenebrosus*, *O. placidus*, and *O. sp.* Caney Fork Ck at Rte 52, E of Portland, 17 Aug 1969, RWB, on *C. graysoni*, *C. tenebrosus*, *O. compressus*, *O. placidus*, and *O. sp.*

*Hosts.*—*Cambarus batchi*\*, *C. diogenes*\*, *C. dubius*\*, *C. friaufi*, *C. girardianus*, *C. graysoni*, *C. laevis*\*, *C. rusticiformis*, *C. striatus*, *C. tenebrosus*\*, *C. (Hiaticambarus)* sp., *C. (Jugicambarus)* sp., *C. sp.*, *Orconectes compressus*, *O. forceps*, *O. placidus*, *O. putnami*, *O. shoupi*, *O. spinosus*, and *O. sp.*

*Drainage systems.*—The range includes segments of the following river basins: Tennessee (including the Holston), Cumberland, Barren-Green, Kentucky, Licking, and Whitewater (to Ohio and Mississippi rivers).

*Dactylocythere myura* Hobbs & Walton

*Dactylocythere myura* Hobbs & Walton, 1970:859, figs. 2e, f, 3e, f, h.—Hart & Hart, 1974:64, pl. XVII, figs. 11–14, pl. XLIX.

*Previously known ranges.*—Only 2 localities in the South Fork of the Holston River basin in Smith and Washington counties, Virginia.

*New locality.*—Tennessee: Sullivan Co., Roadside ditch 11.9 mi SW of Tennessee-Virginia line on US Hwy 11, 13 Sep 1969, RWB, on *C. dubius*. Virginia: Washington Co., Along Garrett Ck, 1.5 mi (2.4 km) S of Holston on Co Rd 11, 9 Aug 1984, GWS, RFJ, on *C. dubius*. Ditch 1.2 mi E of Bowden on US Hwy 33, 10 Apr 1986, GWS, RFJ, on *C. dubius*.

*Host.*—*Cambarus dubius*.

*Drainage systems.*—South Fork of Holston River Basin (to Tennessee River).

*Dactylocythere prionata* (Hart & Hobbs)

*Entocythere prionata* Hart & Hobbs, 1961:174, figs. 15–17.

*Dactylocythere prionata* Hart, 1962:130.—Hart & Hart, 1966:5; 1974:66, pl. XVIII, figs. 11–13, pl. XLIX.

*Previously known range.*—Caves and springs in the Barren, Cumberland, and Kentucky basins of Jackson, Pulaski, and Warren counties, Kentucky.

*New locality records.*—Kentucky: Pulaski Co., Stream flowing into Sloan's Valley Cave, 5 Apr 1969, JEP, DJP, HHH, on *C. tenebrosus*. Taylor Co., 1 mi (1.6 km) SW of Mannsville on Rte 70, 25 Mar 1987, GWS, RFJ, on *C. diogenes* and *C. ortmanni*. Wayne Co., 3 caves: 2 at Rte 92 in Elk Spring Valley between Rte 776 and Oil Valley, and another at Rte 92, NW of Coopersville, 9 Apr 1971, RWB, on *C. tenebrosus*. Oldham-Trimble cos., Pattons Ck, 2 mi (3.2 km) NW of Sligo, 19 Apr 1980, J. A. Thoma, RFJ, M. McCluskey, on *C. diogenes*, *C. ortmanni*, *C. ornatus*, and *O. rusticus*. Tennessee: Clay Co., Hurricane Ck on Rte 52 at Oak

Grove, 20 Mar 1972, RWB, on *C. graysoni*, *C. tenebrosus*, *O. compressus*, and *O. putnami*. Scott Co., Marsh at Kentucky-Tennessee state line on US Hwy 27, 9 Apr 1971, RWB, DAE, on *C. diogenes*, and *C. striatus*.

*Hosts.*—*Cambarus diogenes*, *C. graysoni*, *C. ornatus*, *C. ortmanni*, *C. striatus*, *C. tenebrosus*\*, *Orconectes australis packardii*\*, *O. compressus*, *O. putnami*, and *O. rusticus*.

*Drainage systems.*—Cumberland, Barren-Green, Kentucky and Ohio basins.

*Donnaldsoncythere donnaldsonensis* (Klie)

*Entocythere donnaldsonensis* Klie, 1931:334, figs. 1–9.

*Donnaldsoncythere donnaldsonensis.*—Hart, 1962:131.—Hart & Hart, 1974:78–79, pl. XXIII, fig. 6, pl. L.—Hobbs & Walton, 1976:396, 399, 403; 1977:603, 606, 609, 612.—Hobbs & Peters, 1977:22, 24–25, 30, 33, 38, 41, 44, 50, 52, 55, 57, 69 fig. 21; 1982:300, 307, 308, 311, 312 (fig. 7); 1989:325, 326, 327–328; 1991:67, 69, 70–72, 73, 74.—Hobbs & McClure, 1983:772, 776, 777, 778.

*Donnaldsoncythere hiwasseensis.*—Hobbs & Walton, 1975:10, 12, 13, 18, 19.—Peters, 1975:iii, 5, 7–8, 10, 14, 19–20, 22, 25–31, 33–34, 46.

[For a complete synonymy, see Hobbs & Peters (1977:43–44); only references to localities that have been recorded subsequent to those listed by Hart & Hart (1974) are included here.]

This ostracod occurs so commonly (and on such a wide range of ecologically diverse crayfishes) throughout its known range—according to Hobbs & Peters 1977:44, “northern Georgia to Indiana and Maine”—that there seems little reason to cite new localities that do not extend the currently recognized limits of its distribution. New records that have come to our attention include those in Kentucky: Breathitt, Elliott, Magoffin, Morgan, and Wolfe cos, on *C. dubius*; Virginia: Washington Co., on *C. dubius*; and West Virginia: Boone, Braxton, Greenbrier, Kanawha, Mercer, Pocahontas,



Randolph, Wirt, and Wyoming cos, on *C. carinirostris*, *C. dubius*, *C. monongalensis*, and *C. nerterius*.

*Hosts*.—For reasons pointed out above, listing the large number of hosts here seems a bit excessive. One might anticipate that it probably infests all crayfish species occurring within its range.

*Drainage systems*.—Atlantic Basin: Savannah, Santee, Pee Dee, Roanoke, James, York, Potomac, Susquehanna, Delaware, Hudson, and St. Francis; Gulf of Mexico Basin: Coosa, Tennessee (all tributaries above and including the Sequatchie and in the Elk and Duck), Cumberland (widespread), Ohio (from headwaters and southern tributaries to Whitewater basin in Indiana). St. Lawrence Basin: Lake Erie basin eastward to northern Maine.

*Lordocythere petersi* Hobbs & Hobbs

*Lordocythere petersi* Hobbs & Hobbs, 1970: 11, 16, fig. 9a–d.—Hart & Hart, 1974: 103, pl. XXX, figs. 4–7, pl. LIII.—Hobbs & Peters, 1977:58–59, fig. 30; 1991:72.

*Previously known range*.—Four localities in the Cumberland, Emory, and Hiwassee basins in Whitley Co., Kentucky (type locality), Cherokee Co., North Carolina, and Morgan and Scott counties, Tennessee.

*New locality records*.—Kentucky: Knox Co., G. R. Hampton Elementary School grounds on Rte 11 in Barbourville, 1 Apr 1986, GWS, RFJ, on *C. diogenes*.

*Hosts*.—*Cambarus acanthura*\*, *C. diogenes*\*, *C. dubius*, *C. nodosus*\*, and *C. sphenoides*.

*Drainage systems*.—Cumberland, Emory, and Hiwassee basins (to Tennessee and Mississippi rivers).

*Phymocythere lophota*, new species

Fig. 1d, e

*Diagnosis*.—Male with eye pigmented and located slightly less than 0.2 shell length from anterior margin. Shell (Fig. 1d) subovate, shallowly excavate ventrally anterior to midlength; greatest height about 0.6 shell

length from anterior margin where 1.4 times height at level of eye. Margins entire, lacking emarginations and prominences. Submarginal setae absent dorsally but rather evenly distributed along other borders. Shell length 399–406 ( $\bar{X}$  = 404,  $n$  = 3)  $\mu$ m; shell height 217–224 ( $\bar{X}$  = 219,  $n$  = 3)  $\mu$ m.

Copulatory complex (Fig. 1e) with peniferum arched posteriorly, swollen ventrally and with ventral emargination resulting in bilobed appearance, swollen anteroventral area with crest and produced anteriorly in subacute, sclerotized, beaklike prominence disposed anterodorsally. Long inverted U-shaped penis situated in swollen area, its basal part situated in posterior lobe and apex, which directed anteroventrally, lying in anterior lobe. Clasp apparatus L-shaped with vertical ramus tapering and joining horizontal ramus in gentle curve rather than at angle; latter ramus increasing in size distally and bearing 4 small reflexed subapical denticles; both rami otherwise unadorned. Finger guard tapering from swollen base but slightly compressed and troughlike apically. Ventral finger strongly curved caudally at about 100 degrees at end of basal two-fifths; dorsal finger unremarkable.

*Triunguis female*.—Unknown.

*Type locality*.—Standingstone Creek at bridge on Co. Rd 3, 2.8 mi (4.3 km) NE of Cherry, 4.1 mi (6.6 km) ESE of Elizabeth, Wirt Co., West Virginia. This creek is in the Little Kanawha River drainage. The specimens were collected by G. W. Stocker and R. F. Jezerinac on 7 Oct 1988.

*Disposition of types*.—The holotypic male is deposited in the National Museum of Natural History (Smithsonian Institution), USNM 260074. Paratypes are in the collection of H. H. Hobbs III, Wittenberg University and the Smithsonian Institution.

*Host*.—*Cambarus monongalensis*.

*Entocytherid associates*.—*Donnaldsoncythere donnaldsonensis*.

*Range and specimens examined*.—Known only from a single collection, consisting of 4 males, made in the type locality.

*Relationships.*—This is the second species to be assigned to the genus *Phymocythere*. It differs from *Ph. phyma* in possessing an anterodorsally directed acute prominence on the swollen, crested, bilobed ventral part of the peniferum.

*Etymology.*—*G. lophos* = crest; *lophotos* = crested (*lophotus-a-um*) adj.; alluding to the crest and acute prominence on the anteroventral part of the peniferum.

*Phymocythere phyma* (Hobbs & Walton)

*Entocythere phyma* Hobbs & Walton, 1962: 42, figs. 10–13.

*Cymocythere phyma.*—Hart, 1962:129.

*Phymocythere phyma.*—Hobbs & Hart, 1966:48–49.—Hobbs & Walton, 1966:7; Hobbs, Holt, & Walton, 1967:46.—Walton & Hobbs, 1971:88.—Hart & Hart, 1974:110, pl. XXXII, figs. 7–9, pl. LIII.—Hobbs & McClure, 1983:777.

*Previously known range.*—Twelve localities in the Big Sandy, Cheat, James, New (Kanawha), Potomac, and Tygart basins in Craig, Giles, and Rockingham counties, Virginia; and Greenbrier, McDowell, Pendleton, Randolph, and Summers counties, West Virginia.

*New localities.*—West Virginia: Greenbrier Co., U.S. 219 Cave, 7 Jul 1989, GWS, RFJ, on *Cambarus nerterius*. General Davis Cave, 1 mi (1.6 km) NW of Fort Spring, 9 Sep 1989, GWS, DH, TJ, S. Van Luik, on *C. nerterius*. Wades Cave 3.2 mi S of Maxwellton, 9 Sep 1988, GWS, DH, TJ, on *C. b. carinirostris*. Monroe Co., Steeles Cave (37°33'52"N, 80°33'00"W), 8 Sep 1989, GWS, DH, TJ, on *C. b. carinirostris* and *O. virilis*. McDowell Co., Panther Ck, 5 mi (8 km) S of Panther, 19 Jun 1981, RFT, on *C. dubius*, *C. sciotensis*, *Cambarus* sp., and *Orconectes* sp.

*Hosts.*—*Cambarus b. bartonii*\*, *C. b. carinirostris*\*, *C. dubius*, *C. nerterius*\*, *C. robustus*, *C. sciotensis*, *C. sp.*, *Orconectes spinosus*, *O. virilis* and *O. sp.*

*Drainage systems.*—Big Sandy, Cheat, Greenbrier, New, and Tygart basins (to

Ohio), James, and Potomac basins (to Atlantic Ocean).

*Uncinocythere zancla* Hobbs & Walton

*Uncinocythere zancla* Hobbs & Walton, 1963:456–457, figs. 1–3. Hart & Hart, 1966:8; 1974:140–141, pl. XXXVIII, figs. 10–12, pl. LVII.—Hobbs & Walton, 1976: 397(?); 1977:606.

*Previously known range.*—Hart and Hart (1974:141) cited the localities (29, however, the three records from North Carolina and Georgia were based on misidentifications) and hosts (14, however, three must be deleted for the reason just given) known for this entocytherid at that time. Subsequently 11 more localities, involving 11 additional hosts, became known. Of these, we have been unable to confirm the locality cited by Hobbs & Walton (1977) reporting this ostracod from Sevier Co., Tennessee, on *Cambarus carolinus*; inasmuch as this locality is somewhat removed from the other known localities, and the host is not otherwise known to harbor this ostracod, neither the locality nor the host appears in the summary below. The record in Carter Co., Kentucky, cited by Hobbs and Peters (1989: 326, 327, 328, 329) was based on the misidentification of specimens of *U. simondsi* (Hobbs & Walton, 1960). Until now, the species was known to be widespread in the Cumberland, Duck, and Elk basins, and a few localities were recorded in the northward flowing segment of the Tennessee River. Localities had been established in Adair, Allen, Hardin, and Hart counties, Kentucky; and Cannon, Davidson, DeKalb, Dickson, Fentress, Franklin, Hickman, Humphreys, Lawrence, Lincoln, Marshall, Maury, Perry, Pickett, Putnam, Rutherford, Wayne, Williamson, and Wilson counties, Tennessee. As pointed out by Hobbs & Peters (1977:63) the published records for North Carolina were based on misidentifications.

*New localities.*—More than 100 additional localities are now known from Adair, Al-



len, Grant, Grayson, Hardin, Hart, Logan, Madison, Taylor, and Warren counties, Kentucky; and Bedford, Clay, Cannon, Cheatham, Clay, Coffee, Davidson, DeKalb, Dickson, Fentress, Giles, Hickman, Houston, Humphreys, Lawrence, Lewis, Lincoln, Macon, Marshall, Maury, Montgomery, Overton, Pickett, Putnam, Robertson, Rutherford, Smith, Stewart, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee.

*Hosts.*—*Barbicambarus cornutus*, *Cambarus bartonii bartonii*, *C. b. cavatus*, *C. brachydactylus*, *C. carolinus*, *C. crinipes*, *C. cumberlandensis*, *C. diogenes*, *C. dubius*, *C. friaufi*, *C. gentryi*, *C. girardianus*, *C. graysoni*, *C. ortmanni*, *C. robustus*, *C. rustiformis*, *C. striatus\**, *C. tenebrosus*, *Orconectes barrenensis*, *O. compressus*, *O. erichsonianus*, *O. forceps*, *O. i. inermis\**, *O. mirus*, *O. placidus\**, *O. putnami\**, *O. rhoadesi*, *O. rusticus*, *O. shoupi*, *O. spinosus*, and *O. sp.*

*Drainage systems.*—Tennessee Basin between mouth of Sequatchie River and northward flowing segment (including the Elk, and Duck watersheds), and Cumberland (including the Harpeth), and Green river systems.

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